Watershed Protection: A Statewide Approach
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Chapter 3. Why Manage by Watersheds

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Adopting a watershed approach statewide is an initiative taken by a state water quality agency in consultation with other stakeholders, usually in response to a self-assessment of that state's programs. This chapter discusses why states have adopted statewide watershed management. Most of this discussion concerns states' *expectations* of outcomes based on extensive workshops and planning; it may take several years for these benefits to be achieved and measurable, and state approaches may be revised over time. In some cases, however, states are already benefiting from adopting a watershed-oriented approach, e.g., through improved staff morale or increased miles of streams monitored each year.

In presenting the following expected benefits, EPA does not mean to imply that this is a simple process. It requires time, energy and perseverance, and presents several challenges, as discussed in Chapter 4.

3.1 Water Quality Programs Can Focus More Directly on the Resource

Historically, EPA and state regulatory agencies have organized their water programs around discrete activities such as permitting, monitoring, enforcement and nonpoint source control. As a result, program success tends to be measured in terms of program activities - numbers of permits, compliance orders, inspections, or samples, for example. These activities often do not demonstrate or measure improvements in water quality. Focusing on the entire basin, on the other hand, requires staff in different programs to ensure that their work is consistent with basinwide goals. In other words, the focus on environmental results is sharpened.

3.2 The Basis for Management Decisions is Improved

Organizing around major watersheds or basins can improve the scientific basis for management decision-making in three ways:

- Focusing on basins and watersheds encourages agencies to seek information on all significant stressors, including those that tend to be overlooked by traditional programs (e.g., ecosystem effects due to habitat loss). This encourages monitoring programs to account for the full realm of impacts and sources.

- The pooling of resources and data by multiple stakeholders tends to increase the amount and types of data available for carrying out assessments and prioritizing problems for action.

- Basin-oriented monitoring may result in more detailed information. In North Carolina, for example, approximately 38 percent more monitoring sites were sampled during the first full year than previously, with about the same level of effort.

3.3 Program Efficiency Is Enhanced

Focusing on individual basins can improve program efficiency within the State water quality agency. For example:

- Coordinating monitoring by basin results in more efficient use of staff and reduces travel time between sites.
- Modeling studies can be consolidated to increase the stream miles of waterbody modeled per unit of effort.
- NPDES permit notices can be consolidated by basin to limit the number of publication documents; this requires adjusting permit expiration schedules so that all permits in a basin have the same expiration dates.
- Public meetings can be consolidated to cover multiple permits for a given basin.

The development of basin plans can also be a means to achieve compliance with CWA mandates:

- Basinwide assessment results can support Section 305(b) reporting if a common database is used for basin plans and Section 305(b) reports. For example, basin plans can include water quality assessment text and Waterbody System data summarized by basin. The Waterbody System can then be used to generate the required statewide summary results and tables for Section 305(b) reports. In 305(b) reports, states may choose to reference the basin plans for detailed assessment results, thus avoiding duplication of effort.
- Basin plans can satisfy Section 303(d) reporting requirements since strategies for addressing impaired waters (i.e., actual TMDLs) can be included in basin plans.
- TMDL development often requires a watershed approach. EPA regulations and guidance define a TMDL for a specific pollutant as being equivalent to the loading capacity of a waterbody. This total load includes both point and nonpoint sources. Since nonpoint sources are often diverse and widely distributed across a waterbody's watershed, management strategies that affect the entire watershed are often needed.

3.4 Coordination Among Agencies in the State Can Be Improved

A watershed approach can help clarify the role of the state water quality agency in relation to other natural resource agencies -- those in state and local government as well as federal agencies, such as USGS and USDA, which have state and local offices. Some tasks require site-specific knowledge and close local contact; other tasks need state-level authority or can be more cost-effective at that scale. For instance, the state water quality agency is usually best equipped to conduct laboratory analysis and monitoring and to provide oversight for water quality standards

and discharge permitting. This agency can play a coordinating role to secure support from other state and federal agencies and leverage resources for multi-stakeholder efforts.

The watershed approach provides an umbrella under which local programs can be reinforced and their consistency with state- and basin-level objectives ensured. Local agencies and organizations may be in the best position to develop detailed land use inventories, organize workshops and educational programs, and implement BMPs, habitat restoration and protection, or land use controls.

Improved efficiency may also result from closer coordination among programs. For example, Nebraska's Department of Environmental Quality hopes to reduce the amount of time spent investigating citizen complaints. Through closer coordination, only one agency will respond to each complaint and that agency will determine if further action is needed. In Alabama, many water-related programs are being coordinated through the CSGWPP (see highlight).

3.5 Resources Are Better Directed to Priority Issues

A state is better able to focus its water quality program resources, which are often dispersed among several agencies, on those portions of basins where they will do the most good.

Alabama's Use of Its Comprehensive State Ground Water Protection Program to Coordinate Its Programs

As a first step toward total water resource management, Alabama is coordinating its programs through its Comprehensive State Ground Water Protection Program (CSGWPP). In developing its CSGWPP, the state recognized the unique challenges of ground water protection, including the enormous costs and technical difficulties of ground water remediation, and the difficulty of locating sources of contamination due to the lag time between discharge of pollutants at the land surface and their transport through an aquifer. These challenges emphasize the need for a coordinated state approach centering on common priorities.

Alabama is implementing this coordinated prevention approach through its CSGWPP. All of Alabama's major environmental programs, including its waste programs, are located in the Alabama Department of Environmental Management. In addition, Alabama has established the Water Programs Advisory Committee, which brings together all the major entities with ground water protection responsibilities. Alabama's Department of Agriculture has been a full partner in this effort. Once the CSGWPP has been fully implemented, all ground water-based programs will direct their efforts first at wellhead protection areas. Alabama is also in the process of developing a ground water classification system that will direct program priorities. Currently, the state's Underground Storage Tanks Program is focusing its inspection and prevention efforts in wellhead areas and is spending funds to help delineate the state's wellhead areas.

The watershed approach opens the door to statewide application of risk-based procedures for targeting where and how program resources should be spent. This improved capability is primarily the result of three features of a statewide approach:

- Improved information bases and assessments more clearly identify water quality issues and waterbody concerns for the process of assigning priorities.
- Systematic review of all basins as the state cycles through the sequence allows for comprehensive review of within-basin needs as well as comparison of resource needs among basins.
- Improved coordination among stakeholders produces common management priorities and promotes the leveraging of resources.

3.6 Coordination with EPA Can Be Improved

EPA and the states are already working together on programs with a watershed orientation and extensive stakeholder involvement. Examples of such programs include:

- Chesapeake Bay Program
- Clean Lakes Program
- National Estuary Program
- TMDLs with watershed-wide nonpoint source issues
- Great Lakes Program (especially Remedial Action Plans and Lake Management Plans).

Watershed approaches provide an opportunity for EPA and state agencies to augment one another's efforts *throughout* the state, not just in areas that fall under special programs. In the long run, an approach that serves to clarify roles, identify resource needs, and establish management priorities enhances the efforts of all partners.

States pursuing watershed approaches have identified several ways that EPA can help facilitate the approach. EPA can:

- Issue program guidance that encourages long-term watershed management goals rather than short-term program goals that might draw resources away from the basin planning process
- Negotiate annual or multi-year state program plan commitments that revise traditional reporting requirements (e.g., STARS/SPMS, TMDLs, lists, reports)
- Provide for transfer of information so states can learn from experiences throughout the EPA Region or the Nation

- Make basin planning efforts a priority under grant programs such as the Sections 104(b)(3) and 319 programs
- Where feasible, Regions can work with states to ensure that grants have compatible requirements and planning periods
- Assist in negotiations involving other federal agencies or adjoining states.

Regional Flexibility to Accommodate the Transition

North Carolina officials found that considerable time was needed to plan the state's basin approach. Also, the first round of basin plans are more time consuming than plans will be in subsequent 5-year cycles. The state asked EPA Region 4 for permission to maintain existing effluent limits in cases where NPDES permits came up for renewal ahead of the basin schedule (i.e., prior to the year when all the basin's permits are to be renewed). If approved, state staff would not need to remodel each water quality-limited parameter, and permittees would not be penalized by different effluent limits upon the adoption of a basin plan in 1 or 2 years. The state reasoned that major management decisions should await the improved technical analyses associated with the basin plan. Region 4 agreed that this interim flexibility would further long-range water quality management goals.

3.7 Consistency and Continuity Are Encouraged

By focusing on goals to be achieved over several cycles, the approach reduces the tendency to operate in a reactive or crisis mode. Stakeholders can expect improved continuity in decisions because management actions throughout the basin are fixed for at least the length of a basin cycle. Utilities directors, for example, can better plan their long-term wastewater or water supply needs.

Improved *consistency* is possible because pollution sources across a watershed are evaluated within the same time frame, and because management actions are subject to broad scrutiny during the planning process. Thus, for example, animal producers across a watershed are likely to be subject to consistent impact analysis and management measures. Similarly, all NPDES premittees along a major river may be studied at the same time using the same water quality model; the fact that these stakeholders will be aware of the process and each others' discharge limits tends to promote consistent and equitable permits and may reduce the number of grievances filed by permittees.

3.8 Opportunities for Data Sharing Are Enhanced

Increased data sharing is an important benefit of any process in which stakeholders from different organizations work toward common goals. Most state and local agencies have records and information systems unique to their individual functions. In many states, for example, NPS related data are housed in several agencies and are not readily accessible to outside parties.

Inaccessible data on land use and BMPs presents a significant limitation to some states' NPS efforts (see highlight on this page).

Sharing and linking new computer technologies among different agencies is also encouraged. Geographic Information Systems (GISs) can help analyze spatial data for entire basins using data from several agencies, e.g., to show the relationship between land use and predicted nonpoint source loading. GIS buffering techniques are being used to assess the needs for riparian habitat protection, to design greenway systems, for biodiversity analysis, and for planning wetland banking programs, among other purposes.

3.9 Public Involvement is Enhanced

Watershed protection focuses on a discrete resource around which citizens can rally. The approach promotes awareness of water-related issues by citizens and encourages agencies to respond to their concerns. Opportunities for this interaction occur during basin plan development and activities such as workshops, hearings, and citizen monitoring. An additional benefit of public involvement is that a better informed public can lead to increased citizen and legislative support for water quality programs.

Data Sharing in North Carolina

During its first 5-year basin management cycle, North Carolina is promoting data sharing among natural resource agencies. This initiative might have occurred without a basin approach, but the basin approach has accelerated the process. Initially, a Sub-basin Database was developed containing available data on point sources, land use, agriculture, and other NPSs by watershed for preparing basin plans.

Realizing the need for more detailed nonpoint source data, the state is consolidating NPS and BMP data from multiple agencies, including new information yet to be collected. The Tar-Pamlico Basin will be the focus for system development, and the needs of state and local users and modelers will receive top priority. To the extent possible, spatially based information will be collected for GIS analysis. The agencies' GIS data layers are maintained in the state's Center for Geographic Information and Analysis.

3.10 Innovative Solutions Are Encouraged

Some watershed problems, such as habitat destruction, inadequate stream flow, wetlands loss, atmospheric deposition, and introduced aquatic species, are difficult for traditional water quality programs to address. This approach can provide a strong framework for identifying and solving such problems. Problem identification is made easier by involving technical experts from many fields during the environmental assessment portion of the basin cycle - aquatic biologists working side by side with water resource engineers and agricultural specialists, for example, can share data and perspectives on a basin's stressors. Solutions are not limited by the authority or expertise of a single agency, but rather encompass the range of stakeholders. Following are several nontraditional solutions that are feasible under a watershed approach.

Ecological Restoration - Ecological restoration is the reestablishment of physical, chemical and biological components of an aquatic ecosystem that have been compromised by point and nonpoint sources of pollution, habitat degradation, hydromodification, or other stressors (*Restoration as a Water Resource Management Tool,* U.S. EPA 1994b). Categories of restoration techniques include:

- Techniques applied directly to the stream channel (e.g., channel reconfiguration to restore geometry and sinuosity; streambank stabilization)
- Techniques applied in the riparian zone (e.g., replanting of riparian buffers to increase the canopy and other functions)
- Techniques applied outside the riparian zone that result in instream improvements (e.g., BMPs that reduce stormwater surges and improve riverine habitat).

Restoration activities in the stream channel and riparian buffer zone are much less commonly used than traditional point and nonpoint source controls. Yet, restoration activities may be essential for achieving ecological integrity. Examples include:

- Chronic sedimentation and catastrophic blowouts caused by logging roads; such occurrences may be unavoidable on steep terrain, despite engineered BMPs. Revegetation and road decommissioning may be necessary to restore instream habitat.

Providing Fish Passage

On regulated river systems, impassable barriers sometimes block the migrations of anadromous fishes. The most dramatic cases involve salmon stocks on the Columbia River system in the Pacific Northwest, where dams either interfere with fish passage or, in the case of structures like the Grand Coulee Dam, preclude migration altogether. Other obstructions may be less obvious but equally deleterious. For instance, culverts and minor flood control structures around bridges or stretches of a channelized stream can block the migrations of shad or rock fish. Eliminating such minor blockages is a major goal of the Anacostia River Restoration Project in Maryland and the District of Columbia. On larger systems, retrofitting fish ladders or elevators may be viable options.

- Barriers to fish passage that may prevent reestablishment of important fish species, regardless of water quality (see the highlight above).
- Waterbodies with toxics-laden sediments that must be removed before healthy aquatic communities can reestablish themselves.

In many cases ecological restoration may be the most cost-effective way to achieve watershed water quality goals. The highlight on page 3-10 describes a case in which habitat restoration was preferable to advanced wastewater treatment.

Protection of Critical Areas - The National Research Council recently cited promising examples of restoration projects that have restored functions in small wetlands, stretches of streams, and small lakes (National Research Council, 1992). However, the study did not find cases where populations of fish or wildlife were restored on a broad, regional scale.

Fortunately, long-term biological integrity in a watershed may be possible through a watershed-wide strategy of *protecting and restoring* high priority areas such as headwaters, riparian buffers, and biotic refuges.

Traditional CWA programs may not protect these areas. In many watersheds, for example, headwaters and riparian buffers do not receive protection as wetlands under CWA Section 404. The loss of these areas may reduce or eliminate future opportunities for healthy, balanced biological communities and good habitat. In other words, an "ounce of prevention" by protecting key areas in a watershed may be the only way to ensure long-term ecological integrity and avoid the costs of restoration in the future.

Ecological Restoration as a Cost-Effective Solution

In addition to meeting the needs of living resources, ecological restoration or habitat protection can sometimes increase the capacity of a system to assimilate and transform pollutants. In Boulder Creek and the South Platte River in Colorado, city governments rebuilt natural flood plain meanders and reestablished natural channel depths and near-stream vegetation patterns. These restoration efforts helped reduce the concentrations of un-ionized ammonia in reaches downstream of the cities of Boulder and Denver. This in turn eliminated the need for costly sewage treatment plant upgrades.

Biotic refuges are areas with relatively undisturbed habitat that maintain aquatic biodiversity. They may include the headwaters portion of a watershed or undisturbed riverine segments. A watershed may also contain many smaller patches of intact aquatic habitat (e.g., undisturbed small lakes or stretches of stream with deep pools for fish habitat). These biotic refuges and smaller patches may have been protected by fortuitous land ownerships or simple chance. Scientists now recognize that the restoration of ecological integrity across a watershed or a basin may depend on identifying these special areas and protecting them from disturbance (development pressures and point or nonpoint sources).

For further information on protection and restoration of ecologically important areas, see U.S. EPA (1994b), National Resource Council (1992), Doppelt et al. (1993), and Moyle (1992).

Wetlands Mitigation Banking - This approach has emerged as an alternative to onsite compensation for wetlands loss. In wetlands mitigation banking, larger offsite wetlands are used to mitigate for many smaller development projects. Developers purchase "compensation credits" from the mitigation bank. Wetlands in the bank are created, enhanced, restored, or preserved for this purpose (Environmental Law Institute, 1993).

Wetland mitigation banking potentially can provide greater ecological benefits than onsite, project-specific mitigation - e.g., if the compensation sites are larger and more viable hydrologically and biologically. Also, continuing professional wetland management is more likely to protect water quality than ad hoc management at isolated sites (Environmental Law Institute, 1993).

Ideally, wetlands management will become integrated within comprehensive management programs and the policy of "no net loss" implemented by basin or watershed unit. This approach could provide water quality benefits for the entire basin.

Market-based Solutions - Market-based approaches such as pollutant trading do not have a long history, but some states are developing promising approaches. Pollutant trading between point and nonpoint sources may be feasible in cases where one source category is facing large costs to control pollutants common to other sources. For example, point source dischargers may find it cost effective to provide funds for nonpoint source controls or ecological restoration rather than to add additional treatment. One example is nutrient trading in the Tar-Pamlico Basin of North Carolina, where a consortium of municipalities and other point sources has agreed to fund the State Agricultural Cost Share program for nutrient BMPs in the basin (RTI, 1995). Other market-based applications include wasteload allocation trading among point source dischargers on the same river. Local governments can play a facilitation role in such approaches. In South Carolina, for example, the Bureau of Water Pollution Control hopes to involve regional councils of government in wasteload allocation decisions.